36/31

D.M. 1539/53.

RB 36/31

DEPARTMENT OF MINES.

SOUTH AUSTRALIA.

PROPOSED FOUNDATION DRILLING

MT. GAMBIER HOSPITAL

ASSOCIATED PLAN 53-219

INTRODUCTION.

Following upon a request from the Architect-in-Chief for assistance in determining the foundation conditions at the site of the proposed new hospital Buildings at the Mt. Gambier Hospital, the writer visited the area during 5-6/8/53. Portions of the proposed new hospital and new nurses' quarters are to be multi-storey buildings and the design of satisfactory foundation footings on the relatively steep volcanic ash slopes at the site is a matter of some concern.

GEOLOGICAL CONDITIONS.

The Mt. Gambier Hospital Reserve is situated well up the northern slope of the Mount and near the north-eastern crest of the crater known as Valley Lake. The average fall of the ground surface within the area of proposed new buildings ranges from about 1 in 8.3 to 1 in 9. The surface geological conditions could be observed in a test pit which had been dug to a depth of 5 feet from surface RL. 373 ft. Here the top soil was about 24 inches thick and consisted of black free draining sandy loam containing a fair amount of humus. Below this, the top soil gives way to greenish grey medium granular volcanic ash from which it has been derived by normal soil forming processes. The ash down to depth 5 ft. is more or less unconsolidated or but loosely compacted and is probably reasonably well drained. Individual grains are frequently well rounded and often variable in size from quite fine to grains up to an $\frac{1}{8}$th inch or more in diameter. The larger grains frequently consist of limestone fragments and pieces of scoriaceous basalt. Embedded in the ash are occasional irregularly disposed fragments up to 9-10 inches in diameter of

altered bryozoal limestone - obviously brought up and thrown out with finer volcanic dust by successive explosions during the active life of the volcano. Lumps of consolidated grey-green volcanic ash were noted in the dump of an adjacent excavation (about 10 ft. 6" deep) for a dry well below the new Childrens' Ward at present under construction.

A number of shallow post hole borings were made down the slope of the hill near the main building site, to check the depth of top soil. The location and depths of these holes have been plotted on the accompanying plan. In general, the top soil ranged from 20 to 23 inches thick, but frequently towards the base of the top soil layer and extending into the underlying volcanic ash was a layer of "volcanic gravel" containing a relatively high proportion of irregular shaped fragments ranging from the size of a small pea up to about half an inch across, of broken black scoriaceous basalt.

A new 100 ft. drainage bore has recently been sunk at about 100 yards north-east of the existing main building (RL of collar 353 ft.) and the writer has examined the samples of strata penetrated. These indicate that the first 50 ft. consisted of volcanic ash similar to that obtained in the inspection pit described above, and from 50 ft. to 97 ft. comprised ash with some basaltic fragments and with hard bands of lava at 80-90 ft. and at 95-97 ft. Below 97 ft. to 100 ft. was a cavity presumably at the top the Miocene limestone. This would place the base of the volcanic formation at about RL 255 ft. at this point.

PROPOSED DRILLING PROGRAMME.

Fourteen drill sites were pegged to test the foundation area involved. These pegs were numbered 1 to 14 and their precise locations are indicated on the attached plan, i.e. Bores Nos. 1-4 will test foundation conditions beneath the proposed new nurses' quarters and Nos. 5-14 will test the new hospital area. The areas surrounding Bores Nos. 3, 4, 9, 11, and 12, have been indicated as designed to carry the heaviest loadings.

Recommended bore depths are as follows:-

Bores 3, 4, 5, 9, 11, 12 } (six holes) each 50 ft. = 300 ft.

Bores 1, 2, 6, 7, 8, 10, 13, 14 } (eight holes) each 30 ft. = 240 ft.

Total ..... 540 ft.

Bores 3, 9, and 11 should be drilled with 4 inch sample tube and the remaining eleven holes should be percussion drilled and the sludges retained and bagged at 5 ft. intervals or change of strata.

The cost of this drilling is estimated to be about £225 though this amount might be exceeded if there are many delays occasioned by difficulties of access to the sites. Drilling should be carried out as closely as possible to the sites pegged, and any necessary deviations from these sites should be reported.

PROBABLE FOUNDATION CONDITIONS.

Although the writer's observations have so far been of a more or less superficial nature, nevertheless as a result of the field inspection he has come to the following conclusions regarding the foundations problem:-

1. Under the climatic conditions pertaining and from the composition of the top soil and underlying ash, there is unlikely to be any seasonal instability of the soil due to shrinkage and swelling movements of the clay content. The top soil is sufficiently friable to be well drained and unlikely to build up any appreciable content of unstable clays or to exert any excessive lateral pressures due to down hill creep. The underlying ash is chemically and mineralogically fairly stable. A preliminary report from the petrological laboratory indicates that the approximate composition is:-

Calcite (crystals and free grains)	40%
Clay minerals (halloysite montmorillonite)	20%
Quartz, glass altered felspar, iron oxides and silicate minerals - biotite, hornblende olivine, tourmaline, zircon, garnet, etc.	40%

Further investigations of the clay mineral component will be undertaken but the clay content is probably too low to weaken

the structural stability of the ash.

2. The major, in fact, probably the sole foundation problem to be anticipated here will be settlement due to compaction of the ash material under static load. The upper portions of the ash at least are quite loose and unconsolidated as might be expected from its mode of origin. Whether or not this settlement is likely to be uniform may be better gauged when the foundation sites have been drilled. Triaxial tests on undisturbed samples taken at varying depths should then provide useful data on the actual compaction characteristics of the material.

SUMMARY AND CONCLUSIONS

Fourteen test hole sites have been selected and pegged and a total of 540 ft. of drilling is recommended, of which 150 ft. should be drilled with a sample tube for continuous sampling. Cost of drilling is estimated at about £225.

The volcanic ash material composing the proposed foundation areas is inherently stable material with relatively low clay mineral content. It contains a surprisingly high proportion of calcite and limestone grains presumably derived from the underlying Miocene limestone formation through which the volcano originally burst with obvious explosive violence.

The volcanic ash is only loosely consolidated and is probably capable of considerable compaction under load.

K. R. MILES.

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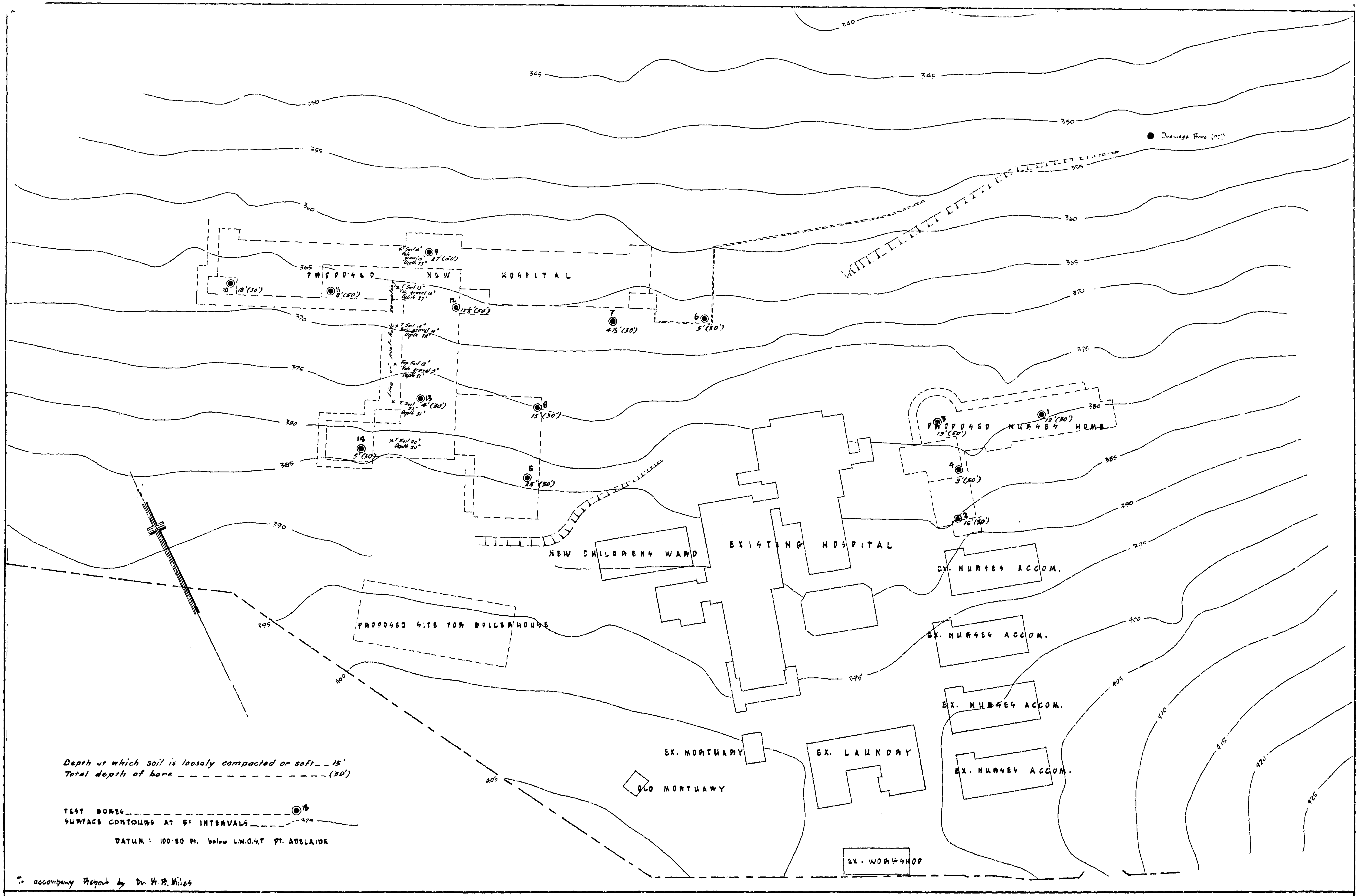
ENGINEERING GEOLOGY & MINERAL RESOURCES SECTION

KRM:AK
17/8/53.


PROPOSED NEW HOSPITAL
PROPOSED NURSES HOME
EXISTING HOSPITAL
NEW CHILDRENS WARD
EX. NURSES ACCOM.
EX. NURSES ACCOM.
EX. NURSES ACCOM.
EX. NURSES ACCOM.
PROPOSED SITE FOR BOILERHOUSE
EX. MORTUARY
OLD MORTUARY
EX. LAUNDRY
EX. WORKSHOP
Drainage Bore
Depth at which soil is loosely compacted or soft _ _ 15'
Total depth of bore _ _ _ _ _ _ _ _ _ _ _ _ _ (30')
TEST BORES _ _ _ _ _ _ _ _ _ _ 13
SURFACE CONTOURS AT 5' INTERVALS _ _ _ _ 375
DATUM : 100·80 Ft. below L.W.O.S.T PT. ADELAIDE

To accompany Report by Dr. H. R. Miles

S.A. DEPT. OF MINES

Reg. No.	
D.M.	
Compiled from	
Associated Drawing / No. / No. / Amendment / Exd. / Date	

MOUNT GAMBIER HOSPITAL

PROPOSED NEW BUILDINGS AND TEST BORES

Approved	Passed		
Director of Mines		Drn. / Tcd. / Ckd. / Exd.	Scale 40 Ft. to 1 inch 53-219 Date 17·8·53